Acquisition of the Japanese Sound System by Second Language Learners: A Study of the Pronunciation of Double Consonants in Japanese

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1 INTRODUCTION

During the course of conversations with non native speakers (NNS) of our language, we may find that the speaker has a peculiar accent. In some cases, this may cause misunderstandings or interference in the oral communication process. It also suggests that the NNS is unable to produce the various sound features of particular words, which indicates there may be certain sounds in the language which cause NNSs recognition and productions difficulties.

Toda (2003) indicates that it may be very difficult for the second language learners of Japanese to recognize and acquire some Japanese morae, especially the double consonant and prolonged vowels. For example, consider the five sentences below.

1, Kite kudasai. (Please come.)
2, Kite kudasai. (Please put it on.)
3, Kitte kudasai. (Please cut it off.)
4, Kitte kudasai. (I need a postage stamp.)
5, Kiite kudasai. (Please listen to me.)

These sentences are not difficult for native speakers of Japanese to recognize or produce. However, even though Japanese native speakers can distinguish the differences without much effort, Toda (2003) indicates that it is generally very confusing for second language learners of Japanese to distinguish the subtle differences in their pronunciation regardless of mother tongue.

One important factor causing the difference in perception between native speakers

(NSs) and non native speakers (NNSs) is the existence of particular Japanese morae. Sentences 3 and 4 include one of these, the double consonant (as in Kitte kudasai) and Sentence 5 another one, the prolonged vowel (as in Kiite kudasai).

Actually, in the concept of the mora-timed rhythm of Japanese, the target words in Sentences 3, 4, and 5 (Kitte and Kiite) have three morae, while the target words in Sentences 1 and 2 (Kite) have two morae.

According to Sukekawa (1993), many experts in Japanese education consider the problem of the second language learners' acquisition of these morae to be a major concern. Sukekawa (1993) also mentioned two problems related to the pronunciation of the double consonant. The problems were the insufficient length of double consonants and incorrect insertion of double consonants into words. This survey implied that a lot of attention should be given to instruction of the double consonant to the second language learners of Japanese.

In this study, I focus on one of these morae, the double consonant. A double consonant is a closed syllable sound, which is counted as one mora in the Japanese rhythmic syllabary. It is written as a small *tsu* (っ or ッ) in the Japanese phonetic scripts (hiragana and katakana), and it appears only before open syllables starting with the consonants/p/,/t/,/s/,/k/, and so on. It also is never in the initial position of a word.

In the rest of the Introduction, I will review some previous studies of the acquisition of the double consonant by second language learners of Japanese, and explain the importance of efforts to investigate the problems related to the acquisition of the double consonant.

1.1 RECOGNITION OF THE DOUBLE CONSONANT

A number of studies have been done on the problems of second language learners of Japanese acquisition of the Japanese double consonant. However, most of the research compares native and non native speakers' perceptions of the double consonant.

Toda (1998) made a cross-sectional study of a group of 10 inexperienced and 10 fluent non native speakers, and 10 native speakers of Japanese to investigate the

differences in where they can perceive the change in the number of morae in particular Japanese words. Results showed that there was a certain perceptual range in judgment of the double consonant sound between non native speakers and native speakers. That is, the perception of where the double consonant dividing line is located in a Japanese word by non native speakers is definitely different from that of native speakers.

Toda (1998) also conducted a longitudinal study of inexperienced non native speakers whose mother tongue was Australian English, and reported on the progress in their ability to distinguish the single consonant from the double consonant.

Enomoto (1992) compared fluent non native speakers with inexperienced non native speakers, and found that the fluent non native speakers' ability to hear and judge when the doubled consonant sound was used, was more similar to the native speakers' ability, than that of the inexperienced non native speakers. However the ability of the non native speakers to use the various sounds in the Japanese language properly depends to a great extent on how the Japanese language was learned. In other words, though there will always be some difference between non native speakers and native speakers, the more non native speakers use the Japanese language, the more the non native speakers' ability to listen and hear Japanese sounds will improve. This will enable the non native speakers' pronunciation to become closer to that of native speakers.

1.2 PRONUNCIATION OF THE DOUBLE CONSONANT

Compared to studies on the perception of the double consonant, relatively little research has been carried out on NSs' and NNSs' pronunciation of the double consonant. However, the ability to pronounce the double consonant has been shown to be a great problem for non native speakers.

Several studies suggest that it is very difficult for second language learners to acquire the Japanese double consonant. It has been shown that non native speakers of Japanese commonly have onset times for the pronunciation of the double consonant that are significantly shorter than those of native speakers, while those for their single consonants is longer. As a result, in the field of Japanese language education,

emphasis is put on pronouncing the double consonant longer.

Lee (1986) studied 79 Korean speaking inexperienced learners' pronunciation of the double consonant and found that they tend to make more mistakes in pronouncing words with double consonants than words with single consonants. Lee (1986) indicates that it is because they do not produce sufficiently long onset times.

Muraki and Nakaoka (1990) researched the acquisition of the pronunciation of single and double consonants by 3 non native speakers whose mother tongue was Chinese, and compared the results with 3 native speakers of Japanese. According to their study, their single consonants were longer and double consonants shorter than those of the native speakers. Muraki and Nakaoka (1990) indicated that most Chinese speaking learners have almost no awareness of this problem. They concluded that a large amount of instruction on the pronunciation of the double consonant is necessary in Japanese education.

Another study concluded with more detailed suggestions for the instruction of the Japanese double consonant. Han (1992) measured the duration times of both single and double consonants of a native speaker and a successful American English-speaking non native speaker of Japanese and compared the ratios. The results showed that the difference between the non native speaker's onset durations for single and double consonants were very small. The ratio of the double consonant pronunciation was approximately 2.8 times as long as the single consonant pronunciation for a native speaker, while a non native speakers' pronunciation was only about twice as long. From this, Han (1992) concluded that non native speakers be taught to make double consonants three times as long as single consonants.

Toda (1994 and 1997) however indicated that the length of NNSs' single consonants was possibly more problematic than the double consonant. Toda (1994 and 1997) did research similar to Han's (1992) on English speaking non native speakers and native speakers of Japanese. She found that the native speakers' double consonants were approximately 2.4 times as long as single consonants, while those of non native speakers were 2 times or less. She also has found that non native speakers tended to produce longer single consonants than native speakers, and suggested that this might significantly affect the time ratios of native and non native speakers.

1.3 THE AIM OF THIS STUDY

Although previous studies have indicated that there are there are some significant problems for second language learners' learning to pronounce double consonants, they have looked at the problem rather narrowly. In this study, I would like to investigate NSs' pronunciation of Japanese double consonants, and compare them with NNSs' pronunciation, subjectively and objectively. The research questions for the study are:

1. Is there any difference between native and non native speakers' "nativeness" of pronunciation as judged by native Japanese raters?
2. Is there any difference between native and non native speakers' pronunciation accuracy, as judged through the word recognition accuracy of native Japanese raters?
3. Is there a relationship between "nativeness" of the pronunciation of particular words and word recognition accuracy?
4. What are the differences between non native speakers' and native speakers' onset times and ratios for each word?

2 SUBJECTS AND METHODS

2.1 SUBJECTS

Subjects taking part in this study were 10 NNSs of Japanese (five males and five females) who have lived in Japan for over three years, and whose mother tongue was North American English (nine were from the United States, and one from Canada). They had different ages, educational, and employment backgrounds. There were three Japanese NS (one male and two female) participants.

2.2 MATERIALS

The sentences used in this study are shown romanized with translations below (the version given to the subjects is in the Appendix). All 14 sentences contain a target word with a single or the double consonant in a sentence written in Japanese. The 14 target words form seven contrasting single-double consonant pairs. In the sentences below the target words are underlined, and the capital letter Q is used to

indicate the double consonant.

Hiragana letters were placed above all the kanji characters in each sentence, so that the subjects would have a less difficult time pronouncing the kanji characters correctly.

1-1. Kore wo kite kudasai. (Please put this on.)
1-2. Kore wo kiQte kudasai. (Please cut this off.)
2-1. Atarashi jinzai wo haken suru. (We sent a new material.)
2-2. Atarashii jinzai wo haQken suru. (We found a new material.)
3-1. Watashi mo shite ita. (I also did that.)
3-2. Watashi mo shiQte ita. (I also knew that.)
4-1. Watashi ga shucho suru. (I will insist.)
4-2. Watashi ga shuQcho suru. (I will go away on business.)
5-1. Yoka ga machidoshii. (I can hardly wait for the vacation.)
5-2. YoQka ga machidoshii. (I can hardly wait for the fourth day of the month.)
6-1. Ishoku no kumiawase de aru. (This is a novel combination.)
6-2. IQshoku no kumiawase de aru. (Both of them have a same color.)
7-1. Teki wo mitsuketa. (We found an enemy.)
7-2. TeQki wo mitsuketa. (We found ironware.)

The version given to the subjects was in Japanese (Appendix). In order to make it easier for the participants to read the sentences, there were hiragana *rubi* above all kanji characters is in the Appendix).

2.3 PROCEDURE

The NNS subjects were first asked to fill out a questionnaire concerning their language background, age, origin, how long and how they had learned Japanese and the frequency of their use of Japanese. Next they were asked to practice reading the 14 Japanese sentences containing either single or double consonants until they were able to read them smoothly with a minimum of effort. Then, they were asked to read the 14 sentences once time and were recorded. Finally, they were informed of the purpose of this study.

The procedure for the NS subjects was the same except they were not asked to fill

out a questionnaire.

2.4 DATA ANALYSIS

After collecting the data from the NS and NNS subjects, the 182 target words (14 per subject) were extracted from the recordings using a *Praat* (Boersma and Weenink 2007) and the voice onset times for each the target single-double consonants were found.

A randomized audio *list* was made of the target words and then played to nine native Japanese speaker raters who were asked to circle whether they heard a single or double consonant and also judge the "nativeness" of the pronunciation on 5-point scale, from 1 for *absolutely native-like* to 5 *absolutely non native-like*.

The data obtained were analyzed by means of Cronbach alpha, Pearson correlation and generalized linear model (GLM) procedures.

3 RESULTS

Results of this study are divided into 6 parts; judgments of nativeness, reliability of judgments of nativeness, word recognition accuracies, relationships between judgments of nativeness and word recognition accuracies, voice onset times for both the single and the double consonants, and their ratios, for each subject.

3.1 NATIVENESS

Table 1 shows the results of mean scores of the judgments of nativeness for each subject. All three of the NS subjects (Subjects 4, 11, and13) were judged to be very native-like. Table 2 shows the medians and standard deviations of the judgments of nativeness by group (NS vs. NNS). Table 3 shows the results of the within subjects multivariate tests (GLM repeated measures) of judgments of nativeness (the single vs. the double consonants) by speaker status (native vs. non native). This result indicates that there is no statistically significant effect related to kinds of consonant ($p = .138$) and no interaction between the variables ($p = .593$). The univariate results (Table 4) however indicate that there is a statistically significant simple effect for speaker status ($p = .036$).

Table 1 The mean scores of judgments of nativeness for each subject

Subjects	NS			NNS									
	4	11	13	1	2	3	5	6	7	8	9	10	12
Mean	1.17	1.46	1.98	3.76	4.40	2.34	3.51	3.63	3.63	2.51	2.94	3.23	3.07

Table 2 Descriptive statistics for judgment of nativeness (the single vs. double consonants) by speaker status (native vs. non native speakers)

	Status	Mean	Std. Deviation	Number
Single	NNS	3.211	0.298	10
	NS	2.587	0.309	3
	Total	3.067	0.396	13
Double	NNS	2.821	0.450	10
	NS	2.397	0.803	3
Total		2.723	0.542	13

Table 3 Within subjects multivariate tests (GLM repeated measures) of nativeness (the single vs. the double consonants) by speaker status (native vs. non native)

Effect	Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Nativeness	0.233	2.565	1	11	0.138	0.189
Nativeness *Status	0.028	0.303	1	11	0.593	0.027

Table 4 Tests of between subjects effects (GLM repeated measures) on nativeness by speaker status (native vs. non native)

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Intercept	70.004	1	70.004	633.628	0.000	0.983
Status	0.633	1	0.633	5.727	0.036	0.342
Error	1.215	11	0.110			

3.2 RELIABILITY OF NATIVENESS JUDGMENTS

Cronbach's alpha (Table 5) shows the reliabilities of the judgments of nativeness for each subject. For two of the NSs, there was no variance, so Cronbach alpha could not be calculated. Judgements appeared to be very consistent (alpha > .80) across raters for one NS subject and six of the NNS subjects. Two of the NS subjects were rated quite consistently (.70 < alpha > .80). The remaining two NNSs (Subjects 2 and 7) were rated somewhat inconsistently (alpha < .70), suggesting variability in their performance.

Table 5 Reliabilities for each subject

Subjects	NS			NNS									
	4	11	13	1	2	3	5	6	7	8	9	10	12
Cronbach's Alpha	-	-	0.86	0.93	0.68	0.91	0.92	0.89	0.69	0.89	0.86	0.79	0.72

3.3 WORD RECOGNITION ACCURACY

Table 6 shows the results of the mean scores for word recognition accuracy for each subject. In addition to the three NNSs, two of the NNSs' words also got high scores for word recognition accuracy. Table 7 shows the medians and standard deviations of word recognition accuracy for each consonant and subject group. Table 8 shows the results of the within subjects multivariable tests (GLM repeated measures) of word recognition accuracy (the single vs. the double consonants) by speaker status (native vs. non native). This result indicates that there is no statistically significant effect related to kinds of consonant and judgments of word recognition accuracy ($p = .668$), and no interaction between the variables ($p = .180$). Table 9 shows the result of the tests of between subjects effects (GLM repeated measures) on word recognition accuracy by speaker status (native vs. non native). This result indicates that there is no statistically significant simple effect for speaker status ($p = .841$).

Table 6 The mean scores of word recognition accuracy of each subject

Subjects	NS			NNS									
	4	11	13	1	2	3	5	6	7	8	9	10	12
Mean	0.96	0.88	0.96	0.66	0.47	0.52	0.4	0.64	0.60	0.90	0.83	0.81	0.67

Table 7 Descriptive statistics for word recognition accuracy (the single vs. the double consonants) by native vs. non native speakers

	Status	Mean	Std. Deviation	N
Normal	NNS	0.6952	0.1039	10
	NS	0.7513	0.1212	3
	Total	0.7082	0.1056	13
Double	NNS	0.7429	0.1400	10
	NS	0.6614	0.0661	3
Total		0.7241	0.1292	13

Table 8 Within subjects multivariable tests (GLM repeated measures) of word recognition accuracy (the single vs. the double consonants) by speaker status (native vs. non native)

Effect	Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Acuracy	0.018	0.194	1	11	0.668	0.017
Accuracy *Status	0.187	2.053	1	11	0.180	0.157

Table 9 Tests of between subjects effects (GLM repeated measures) on word recognition accuracy by speaker status (native vs. non native)

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Intercept	4.689	1	4.689	530.18	0.000	0.980
Status	0.000	1	0.000	0.042	0.841	0.004
Error	0.097	11	0.009			

3.4 NATIVENESS AND WORD RECOGNITION ACCURACY

The Pearson Correlation Coefficient between judgments of nativeness and word recognition accuracy was reasonably strong ($r = -0.726$, $p = .002$). (Pearson's r is negative because nativeness is on a scale from 1 *absolutely native-like* to 5 *absolutely non native-like*.) Although the overall pattern (Figure 1) appears quite clear, two of the subjects appear to be quite far from the "*line*" produced by the others.

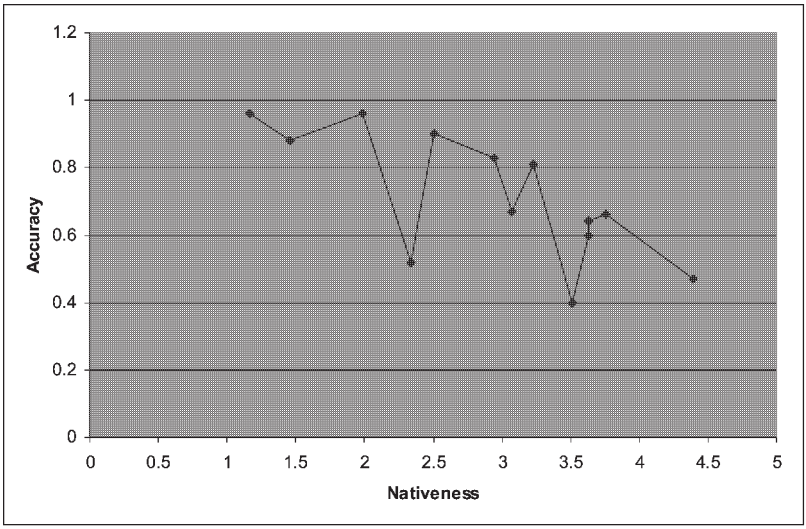

Figure 1. Relationship between nativeness and word recognition accuracy

3.5 ONSET TIMES

To investigate the difference between native and non native speakers' pronunciation objectively, the onset times of each sound were foord. Onset time here mean the length of the silent part between the preceding and following syllable.

Table 10 and Figures 2 and 3 show the mean onset times of the three native speakers and 10 non native speakers, and indicate very clear differences between the groups. The black line represents the onset times for single consonants, and the grey line the onsets for double consonants.

There is a wide interval between the two lines in Figure 2, which indicates that their pronunciation of both sounds are well distinguished and very stable. The onsets

for the single consonants pronunciation were approximately from 0.00 to 0.10 seconds and that for double consonants approximately from 0.20 to 0.30 seconds.

In contrast to the very clear and consistent differentiation between double and single consonants by native speakers, the equivalent data for the 10 non native speakers (Figure 3) shows much less clear differentiation and much greater variability, including a reversal with one word pair, suggesting that the non native speakers' pronunciation may be unstable. The onset times of between 0.20 and 0.30 seconds

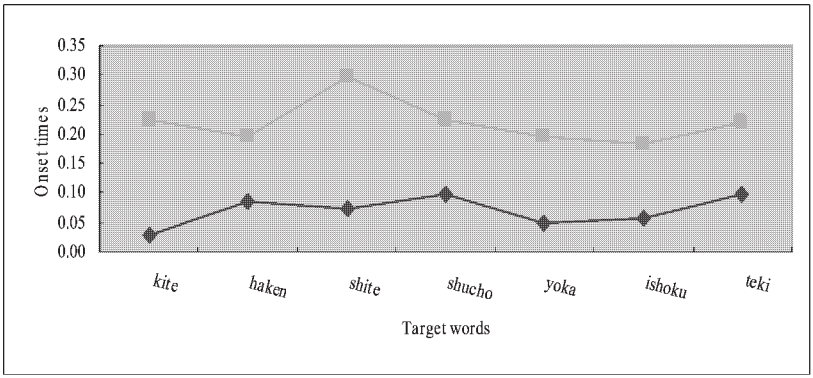

Figure 2. The mean onset times of 3 native speakers

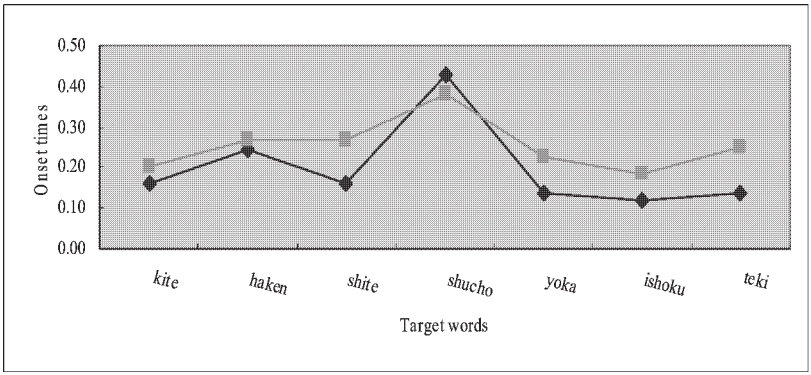

Figure 3. The mean onset times of 10 non native speakers

for double consonants however was about the same as the onset times for the native speakers, but the onset times for single consonants, between 0.10 and 0.20 seconds, was longer than that of the native speakers, between 0.00 and 0.10 seconds.

Tables 11 and 12 below show the results of the within subjects multivariate tests (GLM repeated measures) of onset time (the single vs. the double consonants) by speaker status (native vs. non native) and the tests of between subjects effects (GLM repeated measures) on onset time by speaker status (native vs. non native). These results indicate that there is an overall difference between kinds of consonants' voice onset time ($p = .044$), but no difference for speaker status ($p = .320$) or interaction between them ($p = .124$).

Table 10 Descriptive statistics for voice onset time by Speaker status (NS vs. NNS)

	Status	Mean	Std. Deviation	N
Normal	NNS	0.198	0.140	10
	NS	0.070	0.010	3
Total		0.169	0.134	13
Double	NNS	0.254	0.071	10
	NS	0.220	0.035	3
Total		0.247	0.065	13

Table 11 Within subjects multivariable tests (GLM repeated measures) of voice onset time (the single vs. the double consonants) by speaker status (native vs. non native)

Effect	Value	Hypothesis df	Error df	Sig.	Partial Eta Squared
Voice onset	0.469	1	11	0.044	0.319
Voice onset* Status	0.099	1	11	0.320	0.090

Table 12 Tests of between subjects effects (GLM repeated measures) on voice onset time by speaker status (native vs. non native)

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Intercept	0.318	1	0.318	57.911	0.000	0.840
Status	0.015	1	0.015	2.777	0.124	0.202
Error	0.060	11	0.005			

3.6 ONSET RATIOS

Table 13 shows the descriptive statistics for onset ratio by status (NS vs. NNS). The mean ratio for the non native speakers' was 1.726, which was markedly smaller than the 3.166 for the native speakers'. This result is very similar to Han (1992) and Toda (1994 and 1997). Table 14 shows the results of the univariate GLM tests of between subjects effects of Status on Onset Ratio. This result indicates that this difference was statistically significant ($F=8.132$; df 1,11 ; $p=.061$). The effect size (Partial Eta-squared$=.425$) further indicates that the relationship between Status and Onset Ratio was also substantial.

Table 13 Descriptive statistics for Onset Ratio by Status

Status	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
NNS	1.726	.243	1.192	2.260
NS	3.166	.443	2.191	4.141
Grand Mean	2.446	.253	1.890	3.001

Table 14 Univariate GLM tests of between subjects effects of Status on Onset Ratio

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	4.786	1	4.786	8.132	.016
Intercept	55.211	1	55.211	93.802	.000
Status	4.786	1	4.786	8.132	.016
Error	6.475	11	.589		
Total	66.316	13			
Corrected Total	11.261	12			

4 Conclusion and Implications

4.1 CONCLUSION

In this study, subjective and objective data on the pronunciation of single and double consonants by native and non native speakers of Japanese was analyzed. There were two important results:

1. There is a relationship between judgments of pronunciation nativeness and word recognition accuracy.
2. There is a greater difference between native and non native speakers' onset lengths for single consonants than for double consonants.

The relationship between judgments of nativeness and word recognition accuracy suggests that pronunciation accuracy and nativeness generally go hand in hand. However in Figure 1 (Section 3 above), there were two very clear outliers with atypically low scores for word pronunciation accuracy that did not follow this trend. This suggests that some NNSs can sound quite native but possibly be misunderstood because they have low pronunciation accuracy. While no definite conclusions can be drawn, both of the outliers were teenagers with little formal experience of learning Japanese. It is possible that their young age or lack of a formal language learning experience play a part. More studies should be conducted to look into the effects of age and instruction on pronunciation.

The onset times of the double consonant by non native speakers and native speakers are about the same (approximately from 0.20 to 0.30 seconds), but the onset times of the single consonant by non native speakers is approximately 0.10 to 0.20 seconds longer than the native speakers onset times. Comparing the onset ratios, native speakers' double consonants were approximately 3 times longer than single consonants, while with non native speakers it was approximately 1.7 times longer. This result is very similar to Han (1992) and Toda (1994 and 1997). However, the mean onset times of the double consonant between native and non native speakers were almost same. The difference between native and non native speakers was more significant in the mean onset times of the single consonant.

This indicates, that in Japanese language education for non native speakers, not only should pronunciation of double consonants be taught, but an equal amount of

time should be spent teaching the pronunciation of single consonants. To acquire the double consonant, not only the longer onset duration of double consonants, but also the differences between single and double consonants are very important for second language learners.

4.2 IMPLICATIONS FOR TEACHING JAPANESE

In the field of teaching Japanese as a second language, much more attention should be paid to the acquisition of the double consonant and the distinction between the single and the double consonants.

One way I propose to help learning the correct pronunciation of the double consonant of Japanese is to pronounce words, including words with double consonants, while clapping hands rhythmically or using a metronome. This will help second language learners to understand mora and the difference between the single and the double consonants. Of course, it is impossible for second language learners to acquire Japanese perfectly, but they can approach native-likeness if they train consciously. The most important key to the approach is to be conscious.

4.3 IMPLICATIONS FOR FURTHER STUDIES

Studies with a wider focus are needed. There may be more factors that influence the results. For example, studies that focus on age of acquisition, language experience, mother tongue, origin, and other possibly relevant factors may produce interesting new findings.

This study investigated a narrow range of vowel and consonant combinations. Figure 3 in Section 3 above suggests that there may also be variation in performance caused by words with different combinations of vowels and consonants. Further studies with an expanded range of vowel-consonant combinations at varying locations within target words may provide some interesting new insights into the acquisition of single and double consonants in Japanese as a second language.

References

Enomoto, K (1992). Interlanguage phonology: the perceptual development of durational contrasts by English-speaking learners of Japanese. *Edinburgh Working Papers in Applied Linguistics 3*, 25-36.

Han, M.S. (1992). The timing control of geminate and single stop consonants in Japanese: a challenge for nonnative speakers. *Phonetica 49*, 102-127.

Lee, M. (1986). A Survey of hearing and speaking ability of Korean students learning Japanese in primary course. *The Japanese Language Review 26*, 38-48.

Muraki, M. & Nakaoka, N. (1990). *Kouza nihongo to nihongo kyouiku 3 nihongo no onsei, onin*. Tokyo: Meijishoin.

Boersma, P. & Weenink, D. (2007). Praat (version 4.6.34) [computer software]. Retrieved from http://www.fon.hum.uva.nl/praat/

Sukekawa, Y. (1993). Bogo betsu ni mita hatsuon no keikou: Anketo chousa no kekka kara. *Nihongo Onsei to Nihongo Kyouiku*, 187-222.

Toda, T. (1994). Interlanguage phonology: Acquisition of timing control in Japanese. *Australian Review of Applied Linguistics 17-2*, 51-76

Toda, T. (1997). Nihongo gakushusha ni yoru sokuon, choon seisei no strategy. *Acquisition of Japanese as a Second Language 1*, 157-197

Toda, T. (1998). Perceptual categorization of the durational contrasts by Japanese learners. *Studies in Language and Literature. Language 3*, 65-82.

Toda, T. (2003). Acquisition of special morae in Japanese as a second language. *Journal of the Phonetic Society of Japan 7-2*, 70-83.

Appendix

1-1, これを着てください
1-2, これを切ってください。

2-1, 新しい人材を派遣する。
2-2, 新しい人材を発見する。

3-1, 私もしていた。
3-2, 私も知っていた。

4-1, 私が主張する

4-2，私が出張する。

5-1，余暇が待ち遠しい。
5-2，四日が待ち遠しい。

6-1，異色の組み合わせである。
6-2，一色の組み合わせである。

7-1，敵を見つけた。
7-2，鉄器を見つけた。

要旨

第二言語学習者にとって日本語の「促音」の習得が困難であることが数多く報告されており，日本語ネイティブに比べて促音は短めに，非促音は長めに発音される傾向があるという。

日本語ノンネイティブの促音の発音の実態を調べるため，今回の調査では，英語を母語とする日本語ノンネイティブ10名，及び日本語ネイティブ３名それぞれの発音について比較・分析を行った。

この分析により，被験者の発音サンプルを別の日本語ネイティブに聴取してもらった結果，ネイティブらしさ，聴取の正確さともに日本語ネイティブのほうが高く判断されており，両者には強い相関関係があることもわかった。また，被験者の発音について音響分析を行った結果，促音と非促音の音節間持続時間の比率は，日本語ネイティブが約３倍であったのに対し，ノンネイティブは約1.7倍であった。これはネイティブとノンネイティブの発音には差があることを示唆しているが，被験者間の平均持続時間を比較してみると，促音の持続時間においては大きな差は見られなかった。この実験においてネイティブとノンネイティブの発音の差が顕著に表れていたのはむしろ非促音のほうで，ノンネイティブの平均持続時間はネイティブに比べて約２倍長めであることがわかった。